Emission and performance characteristics of waste cooking oil biodiesel blends in a single direct injection diesel engine

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Abstrak

The use of Waste Cooking Oil (WCO) as feedstock, and microwave heating technology are favored to reduce the cost of biodiesel. In order to identify the effect of using biodiesel from WCO Methyl Ester (WCOME) blends on diesel engine emissions and performance, WCOME blends were tested in a single-cylinder Direct Injection (DI) diesel engine at a constant speed of 2500 rpm and with five loads. For comparison, commercial diesel fuel, Petron Diesel Max (PDM), and biodiesel mixture from palm oil (POME) were also used. The performance and emission test results of the five test fuels: PDM, BP10, BP20, BW10, and BW20 were then compared with simulation results created by using GT-Power software. The experimental results indicated that using POME and WCOME blends led to increments in Brake Specific Fuel Consumption (BSFC) of up to 5.9% and reduction in Brake Thermal Efficiency (BTE) of up to 29.3% compare to PDM. These biodiesel blends also increased nitrogen oxide emissions and decreased carbon dioxide, carbon monoxide and hydrocarbon emissions for all engine loads at a constant speed of 2500 rpm. The experimental testing of the cylinder peak pressure demonstrates significant increase with the increase of engine load for the four test fuels. All the simulation graphs show similar trends.